WILLKIE FARR & GALLAGHER LLP

1875 K Street, NW
Washington, DC 20006

Tel: 202 303 1000
Fax: 202 303 2000

May 3, 2007 ***Ex Parte Notice***

Marlene H. Dortch
Office of the Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: In the Matter of the Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3-17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-directionally in the 17.3-17.8 GHz Frequency Band, IB Docket No. 06-123

Dear Ms. Dortch:

On May 2, 2007, Joseph M. Sandri Jr., FiberTower Corporation's ("FiberTower") senior vice president for regulatory and government affairs, Dr. William Rummler, technical consultant to FiberTower, Philip Verveer and the undersigned, counsel for FiberTower, met with Julius Knapp, Ira Keltz, Ron Repasi, and Ronald Chase to discuss certain technical issues related to the use of 17/24 GHz frequencies by DBS licensees and the potential for interference to 24 GHz terrestrial facilities. Attached hereto are Dr. Rummler's preliminary technical recommendations and other materials summarizing the substance of the discussion.

Should you have any questions regarding this matter, please do not hesitate to contact the undersigned.

Respectfully submitted,

/s/

McLean Sieverding
Counsel for FiberTower Corporation

cc: Julius Knapp
Ira Keltz
Ron Repasi
Ronald Chase

FIBERTOWER CORPORATION

FiberTower supports prompt commencement of the 17/24 GHz Broadcasting Satellite Service ("BSS") and continues to seek ways to work with the Commission and BSS operators to develop technical requirements for successful inter-service operations and sharing in the 24 GHz band.

However, the significant potential for harmful interference from BSS feeder-link stations to existing FS operators in the 24 GHz band is a serious threat that must be addressed by the Commission prior to commencement of the BSS.

One efficient and balanced approach to alleviating the interference impediments to coexistence in the 24 GHz band would be to establish an exclusion zone of 100 miles around the boundaries of 24 GHz fixed service wide-area licenses. This pragmatic solution is ideal for a number of reasons, including, among others:

- **Greatly Reduces Need for Comprehensive Band Sharing Criteria:** Should the Commission allow BSS feeder links in FS-licensed areas, numerous significant technical unknowns would need to be fully explored and vetted by the providers of both services, which would be costly and time consuming. Geographic separation allows for prompt commencement of the BSS until comprehensive sharing criteria are developed to ensure a predicable and stable interference environment, should such criteria become necessary.

- **Limited BSS Feeder Links Minimizes Burden:** The number of BSS feeder links are expected to be very limited (*see, e.g.*, DirecTV Comments at 29; SES Americom Comments at 23). Further, considering eighty to ninety percent of the U.S. geography is unlicensed for terrestrial FS operations, requiring, initially, that BSS licensees locate feeder-link earth stations well outside of FS-licensed areas is a minimal burden.

- **Preserves Benefits of Wide-Area Licenses:** Geographic separation preserves an important benefit of the area-wide license concept, which permits providers to continuously optimize their networks in response to changes in technology and demand. This approach would substantially limit costly and time consuming coordination procedures that would be required when a provider's service footprint changes, which predictably it often will.

- **Protects Investment by Incumbents:** Geographic separation is consistent with the Commission's policy of limiting the disruption faced by existing licensees when bands become shared. This would avoid diminishing the considerable investment in facilities, customer contracting, and deployment planning that incumbent FS providers have already made.

An alternative or complementary approach includes locating BSS feeder links closer to FS-licensed area boundaries if the PFD limit in Section 101.509 of the Commission's Rules is modified from -114 dBW/m2/MHz to -142 dBW/m2/MHz.

- **Straight-Forward Technical Solution:** This approach has the advantage that it can be easily applied and implemented consistent with the Commission's Rules. Thus, it could facilitate the rapid introduction of the BSS into the 17/24 GHz bands while providing adequate protection to the existing and future FS systems in the 24 GHz band.

BEFORE THE

Federal Communications Commission

WASHINGTON, D.C.

In the Matter of	)	
	)	
The Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3-17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-directionally in the 17.3-17.8 GHz Frequency Band	)	IB Docket No. 06-123

COMMENTS OF FIBERTOWER CORPORATION

FiberTower Corporation ("FiberTower"), by its attorneys and pursuant to Sections 1.415 and 1.419 of the Commission's Rules, 47 C.F.R §§ 1.415, 1.419, hereby files comments on the Notice of Proposed Rulemaking in the above captioned proceeding,[1] which specifically seeks to promote "prompt commencement" of the 17/24 GHz Broadcasting Satellite Service ("BSS"). BSS is intended to introduce a new generation of broadband services to residential and business subscribers in the United States. FiberTower supports the general goal of more intensive use of spectrum. It also supports the Commission's specific goal of commencement of BSS operations and, in accordance with paragraphs 91-92 of the NPRM, is prepared to contribute to efforts to

---

[1] See *The Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3-17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-directionally in the 17.3-17.8 GHz Frequency Band*, Notice of Proposed Rulemaking, IB Docket No. 06-123, FCC 06-90 (rel. June 23, 2006) ("*NPRM*").

resolve the questions regarding technical requirements for inter-service operations and sharing in the 24 GHz band.[2] It is important to understand at the outset, however, that since the technical data and assumptions presently before the Commission for both BSS and FS operations are outdated, reliable answers concerning band sharing criteria will only become available following the substantial expenditure of time and resources devoted to that end. This inevitably creates tension with any specific goal of prompt commencement of BSS. As described below, the best path to this goal involves locating BSS feeder-link stations sufficiently beyond the boundaries of terrestrial FS licensed areas, but its success is doubtful otherwise.

I. INTRODUCTION AND SUMMARY

FiberTower is a leader in delivering wireless backhaul[3] and access[4] services to mobile carriers and the enterprise and government markets. FiberTower's extensive 24 GHz spectrum assets (at 24.25-24.45 GHz and 25.05-25.25 GHz) in 77 markets covers nearly ninety percent of the U.S. population in the top 100 markets, but only about ten percent of the U.S. geography. When combined with its 39 GHz footprint that covers 99 percent of the U.S. population, FiberTower is very well positioned to provide high capacity connectivity to the vast majority of

---

2 *See NPRM* at ¶¶ 91-93.

3 "Wireless backhaul" connects cell sites to a fiber backbone or back to the switch site through the use of wireless transport and hub sites. Radios are placed at the cell site and at the hub site, allowing the backhaul provider to wirelessly transmit backhaul traffic between these two points.

4 "Wireless access" provides high speed voice and data transport between two or more customer locations, or between a hub and a customer location. It can be utilized in many different network topologies, from basic point-to-point networking, to more advanced tree, chain, ring or mesh configurations.

cell sites and office buildings that may not have access to fiber, or are seeking a wireless redundancy solution.[5]

The availability of reliable wireless backhaul and access services is increasingly becoming an operational imperative in a number of high-growth areas, for example:

- *Mobile Carrier Migration to 3G*: As mobile carriers transition to 3G, the additional data transmitted is expected to quadruple by 2010. Wireless backhaul provides the capacity and reliability to enable this migration in a cost-efficient way.

- *Enterprise and Government Adoption of Wide Area, Carrier Ethernet*: Carrier Ethernet service demand is expected to jump 10 times by 2010, becoming ubiquitous in both the WAN and the LAN environments. Wireless Carrier Ethernet reaches the vast majority of enterprises and government agencies that cannot get access to high capacity connectivity.

- *Government Mandate for Diverse and Redundant Connectivity*: Federal government requirements for government offices to have physically diverse networks have recently been instituted.[6] Wireless backhaul provides redundancy without the need for additional wired installations.

- *Proliferation of WiFi and WiMax Networks*: Due to the expanding use of these high-bandwidth options, wireless backhaul of WiFi/WiMax networks is expected to grow from $1 million in 2005 to nearly $130 million in 2009.

This connectivity advances a number of important Commission goals, including ensuring the availability of, and access to, reliable broadband services, and supporting broadband competition as wireless broadband services are increasingly viewed as substitutes for traditional wired networks. Based on these benefits and the considerable investment that terrestrial wireless fixed service ("FS") operators have made to bring these important services to the marketplace, the

---

[5] Studies show that less than 6% of cell sites and 15% of enterprises in the US have access to fiber. Because of this, the vast majority of mobile backhaul networks, enterprises and government agencies have been "un-served" in terms of high capacity connectivity.

[6] *See* Public Law 108-447, Section 414; s*ee generally* Randolph J. May, *Preventing a Communications Blackout: The Need for Telecom Redundancy*, The Progress & Freedom Foundation (Release 10.24, Dec. 2003).

Commission should approach the BSS and licensing issues affecting FS providers in the 24 GHz band with an appropriate degree of caution.

In the interest of providing sufficient protection to the hub and user stations of 24 GHz FS systems once BSS operations begin in the band, the Commission seeks comment on (1) whether the existing power limits for satellite earth stations in bands shared co-equally with terrestrial radiocommunications services are at the appropriate level, and (2) whether the antenna pattern requirements applicable to BSS feeder-link stations should be modified in any way to relieve the coordination burden on either or both services.[7] It is difficult to respond to these requests in part because the record is quite incomplete. The characteristics of the proposed BSS feeder links and the BSS system are not well defined, and the FS operations in the 25.05-25.25 GHz band are licensed on an area basis and recent developments concerning available equipment and architectures add substantial complexity and numerous variables. Accordingly, in order to actually understand the technical interference issues raised by the prospect of BSS uplink operations geographically collocated *within or near the same area occupied by FS wide-area licenses*, significant information is needed, including, but not limited to:

- Introduction into the record in this proceeding of all filings at the Commission by the BSS community (license applications, technical proposals, technical ex parte materials, deployment architectures, etc.).
- Specification sheets (i.e., "spec sheets") detailing the precise BSS uplink equipment proposed for use.

Also, numerous questions need answering, including, but not limited to:

- Is it accurate that all the proposed and envisioned systems are geosynchronous orbit (GSO) systems? Are non-geosynchronous orbit (NGSO) systems to be accommodated?

---

[7] See NPRM at ¶ 92.

- Are BSS uplinks proposed for operation at angles that cross over FS license areas? At what angle(s), power(s) and frequencies? Is automated power control placed into these designs?

- Are BSS mitigation techniques like shielding and earth berms in the proposed uplink designs?

- Where are uplinks proposed for operation? How many? What is the proposed deployment schedule?

The only procedures for frequency coordination with an area-licensed service are those that can be inferred from Section 1.4.5 of Appendix 7 of the international Radio Regulations or from Section 1.4.9 of Annex 1 to Recommendation ITU-R SM.1448. These contain similar language that "for fixed earth stations that operate at unspecified locations within a service area defined by the administration, the coordination area is determined by extending the periphery of this service area by the maximum coordination distance." Since the reverse situation applies in the 24 GHz band, the implication is that sharing should be implemented on the basis of geographic segmentation. That is, the area of operation of the FS in the 24 GHz band should be protected on this basis.[8]

If this straightforward, prophylactic approach is not used, things become a great deal more complicated. For example, in order to assess what operational restrictions should be applied to BSS systems and to the BSS feeder-link stations, a number of the characteristics and basic operational parameters of these systems and stations would need to be specified. Although all systems filed with the Commission evidently use GSO satellites, it is not clear whether or not

---

[8] Although the procedures of Recommendation ITU-R SF.1707 could be applied, they are only relevant when the other service (the BSS feeder links at 25 GHz) is not intensively used. As discussed in the following text, the potentially large coordination areas that are possible with some of the proposals in this NPRM, the use of the 25 GHz band by the BSS would not qualify unless significant operational restrictions were applied to the transmitting earth stations.

all future systems in the 17/24 GHz band would also use GSO satellites or might also use any of the various types of non-GSO satellites.

Further, the e.i.r.p. limits that apply to the BSS feeder-link earth stations are also a matter of great concern to the FS. The limits of § 25.204(b) of the Commission rules seem to be excessively permissive, and have not been revisited to take into account present-day equipment and system architecture developments. The implementation of earth stations operating near these limits would require that they be located at distances beyond the radio horizon from the FS operating area. These separation distances would typically exceed 100 miles. The need for such high levels of e.i.r.p. towards the horizon is not obvious. The FS operates its communication links within an e.i.r.p. limit of 55 dBW per transmitter in most frequency bands. This is a significantly lower level of e.i.r.p. than the value of 64 dBW per MHZ permitted under § 25.204(b). The e.i.r.p. toward FS receivers could be reduced significantly by requiring the use of sufficiently large antennas and/or by limiting the minimum elevation angle of the main beam of the earth station antenna. At the same time, the gain pattern should continue to satisfy the requirements of the Commission,[9] or preferably, those given in Appendix 7 of the Radio Regulations.[10] The use of large antennas would be consistent with our perspective that the number of these earth stations needed to provide service in the 17/24 GHz band in the U.S. would be small, perhaps one or two per system or as many as five in the country. Requiring larger earth station antennas would increase their cost but could greatly simplify the coordination, which would be an advantage for both the FS and the BSS. It would be useful if the Commission

---

9 *See* 47 C.F.R. § 25.209(b).

10 *See* Section 3 of Annex 3 to RR Appendix 7.

could determine from the proposed users of the BSS allocation the numbers of earth stations that they anticipate building both initially and in the future.

In developing the rules for the implementation of 17/24 GHz BSS operation, the Commission may wish to refer to the limits imposed on earth station on vessel operations as a framework for limiting the e.i.r.p. of the potential source of interference into the FS.[11] In developing the e.i.r.p. limits on the BSS transmitters, the Commission should clearly define whether the limits are intended to be limits on the "clear air" emissions or the maximum emissions that are employed in the presence of heavy precipitation. Because the correlation of rain attenuation on the earth-space path with rain attenuation on any particular FS link is not well understood, this is a matter of critical importance to the FS.

FiberTower respectfully finds a substantial portion of foregoing efforts unnecessary. As detailed below, a readily available solution exists.

II. PROHIBITING BSS FEEDER-LINK STATION FROM OPERATING WITHIN 100 MILES OF 24 GHZ TERRESTRIAL FS LICENSED AREAS IS A REASONABLE AND COST-EFFECTIVE WAY TO AVOID INTERFERENCE AND IS NECESSARY TO ENSURE PROMPT COMMENCEMENT OF BSS

In the NPRM, the Commission asks whether existing power limits for satellite earth stations[12] and the antenna pattern requirements that apply to BSS feeder-link stations[13] require revision, either to strengthen or relax the restrictions placed on the BSS.[14] The Commission also asks whether the existing coordination mechanism for minimizing interference between satellite

---

11 *See* 47 C.F.R. § 25.204(h).

12 *See* 47 C.F.R. § 25.204.

13 *See* 47 C.F.R. § 25.209.

14 *See NPRM* at ¶ 92.

earth stations and FS stations, in bands where both services share equal rights, is adequate.[15] The tests and analyses necessary to answer these questions will be very time consuming and costly. Furthermore, the ongoing costs of complying with coordination procedures, once technical issues are sufficiently understood, would be substantial. This is a function of the nature of FS licenses. The very essence of the area-wide license concept is to permit providers to continuously optimize their networks in response to changes in technology and demand. Thus, when a provider's service footprint changes, which predictably it often will, time consuming and costly coordination procedures would be required unless an interim solution designed to avoid these complications is straightforward ─ simply require that BSS feeder-links be located at least 100 miles outside of 24 GHz terrestrial FS licensed areas.

Given the very limited geographic coverage areas of existing 24 GHz FS licenses, and the modest number of BSS feeder-link stations that will be necessary for the provision of BSS, it is perfectly feasible for these BSS feeder-links to be placed in more remote locations, at least 100 miles from the periphery of existing FS license areas. This approach not only obviates the need for immediate and extensive co-location testing and co-location interference analyses, it also postpones coordination costs that are certain to arise in any spectrum sharing environment.

Should the Commission allow BSS up-link stations to be located within FS licensed areas, great care should be taken in setting forth detailed and dependable service and technical rules to ensure that interference is avoided. Furthermore, despite the co-primary status of FS and BSS operators in the 24 GHz band, the Commission should adhere to its policy of limiting the disruption to existing licensees when bands become shared, and avoid diminishing the

---

[15] *See* 47 C.F.R. § 25.203.

considerable investment in facilities, customer contracting, and deployment planning that incumbent FS providers have already made. FS providers in wide-area bands often engage in detailed contracts to deploy services over large geographic areas on deployment schedules that involve detailed, staged deployment timelines and significant upfront resource planning.

Thus, the suggested approach for deploying BSS outside the FS license areas is fully consistent with the Commission's rules regarding the choice of sites for earth stations operating in frequency bands shared with equal rights between terrestrial and space services. Specifically, § 25.203(a) requires that such sites "shall be selected, to the extent practicable, in areas where the surrounding terrain and existing frequency usage are such as to minimize the possibility of harmful interference between the shared services."[16] Applying the fundamental goal of this rule in earnest, it would be more than reasonable for the Commission to require that BSS feeder-link station be placed 100 miles outside of FS terrestrial licensed areas.

Considering that between eighty to ninety percent the U.S. geography is unlicensed for terrestrial FS operations, the burden upon BSS licensees by requiring, initially, a limited number of necessary BSS feeder-links be located well outside of FS licensed areas is minimal compared to the significant time and expense ultimately required of both FS and BSS operators alike to establish comprehensive sharing criteria and then to comply with ongoing coordination obligations.

In addition to specifying minimum distance restrictions on the location of BSS feeder-links, it may be appropriate for the Commission to also initially limit the number of allowable BSS feeder-links nationally to less than five, at least until mutually acceptable analyses and

---

[16] 47 C.F.R § 25.203(a).

supporting data are available to affirmatively show that additional BSS feeder-links are actually necessary and that they can be operated in greater numbers without causing interference to FS providers in existing license areas. Then, if the Commission determines that additional flexibility is necessary to allow for more extensive use of BSS feeder-links, the large amount of U.S. geography that is unlicensed for terrestrial FS operations is vast enough that any adverse impact on BSS operators that must initially operate outside FS licensed areas should be minimal.

In light of the Commission's goal of prompt commencement of BSS, this approach overcomes the serious obstacle that significant technical issues have not yet been adequately explored in the period since the Commission allocated these frequencies for BSS use. Should the Commission allow BSS feeder-links in FS licensed areas, numerous significant technical unknowns would need to be fully explored and vetted by the providers of both services.[17]

III. BEFORE THE COMMISSION ALLOWS BSS FEEDER-LINKS IN OR NEAR TERRESTRIAL FS LICENSED AREAS, (1) COMPREHENSIVE SERVICE RULES AND COORDINATION REQUIREMENTS THAT REFLECT THE CURRENT REALITIES OF BOTH FS AND BSS MUST BE ESTABLISHED, AND (2) SIGNIFICANTLY MORE INFORMATION ABOUT BSS AND FS OPERATIONS NEEDS TO BE INTRODUCED INTO THE RECORD

As described above, in order to achieve the specific goal of prompt commencement of BSS, the Commission would be reasonable to require that initial BSS feeder-links be located at least 100 miles outside of the existing 24 GHz terrestrial FS licensed areas. Should the Commission allow such feeder-links within or near FS licensed areas, irrespective of the number of stations that are permitted, the Commission must take great care in ensuring that the technical

---

[17] In paragraphs 28-31 of the NPRM, the Commission discusses the reasons for not permitting the use of BSS earth stations in the U.S. in the 17.7-17.8 GHz band. FiberTower supports this position, as it would not be possible to coordinate such use with the ongoing FS operations in this band. Further, to implement BSS in this band would require a reallocation of this segment from the FS to the BSS. Such a further change to the U.S. allocation table would again disrupt operations of the FS in order to rechannelize the 18 GHz band.

coordination models, supporting data and assumptions upon which band-sharing criteria are based are valid. Further, the Commission must avoid, to the extent possible, diminishing the considerable investment made by the incumbent FS providers to date, and those investments for the substantial regional and national deployments which are planned or underway.

A. Considerable Testing and Analysis is Necessary to Update the Technical Coordination Model and Supporting Data Upon Which the Commission Must Rely if Establishing Robust, Scalable Inter-Service Operations in the 24 GHz Band.

The 24 GHz band is now allocated on a co-primary basis to both the FS and the fixed satellite service (earth-to-space). Therefore, as the Commission correctly acknowledges, the "potential exists for 17/24 GHz BSS feeder-link earth stations operating in the 25.05-25.25 GHz band to interfere with existing and future 24 GHz FS hub and *user stations* that operate in the same frequency band." (Emphasis added)[18] When the Commission initially adopted the shared BSS allocation at 24 GHz in 2000, the full extent of such interference potential was unknown. In fact, at that time, the Commission's "belief in the feasibility of sharing was based on limitations on the number of expected 17/24 GHz BSS feeder-link facilities and the fact that potential interference to the 24 GHz service would be limited to hub stations."[19] Hence, limited data available to the Commission at that time were, and are, dated. Even the data contained in some of the more recent BSS applications that have been filed,[20] which the Commission indicates it will use "as a basis for developing service rules for BSS systems in these bands[,]" may not accurately reflect all mutual interference potential and concomitant coordination limitations that define BSS. As explained above, sufficient technical parameters do not appear to be a part of the

---

18 *NPRM* at ¶ 91.

19 *Id.* at ¶ 32.

20 *See id.* at ¶ 6.

public record to allow such analysis. At the same time that the BSS service technology has been evolving, we also note that the technical characteristics defining terrestrial FS have also evolved dramatically.

In the six years since the Commission first assumed that interference would be limited to FS hub sites[21], the terrestrial FS Service landscape has also changed significantly. For example, 24 GHz has seen the development and deployment of next-generation point-to-multipoint systems. Material developments in lower profile antennas, multipoint systems, Ethernet and other technologies have all occurred in this decade and need careful consideration. Thus, as the Commission now considers technical rules and sharing criteria for BSS and FS, it must acknowledge that the available factual predicate (i.e. the basis for previous assumption that interference would be limited to FS hub sites) is still not sufficient to permit the immediate rigorous technical analysis required to ensure the interference-free operation of BSS feeder-links in terrestrial FS service areas.

This lack of a necessary factual background also makes it imperative, at this time, for the Commission to consider a number of other issues raised in the NPRM. For example, the Commission seeks comment on whether it should establish an expedited process for licensing uplinks in the 24 GHz band.[22] FiberTower agrees that up to five stations, situated beyond 100 miles of the area licensed boundaries of the 24 GHz FS licensees could be licensed on an expedited basis. The Commission also requests comment on how it should process licensing

---

[21] *See Redesignation of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Stations in the 17.7-20.2 GHz and 27.5-30.0 GHz Frequency Bands, and the Allocation of Additional Spectrum in the 17.3-17.8 GHz and 24.75-25.25 GHz Frequency Bands for Broadcast Satellite-Service Use*, Report and Order, 15 FCC Rcd. 13430 (2000).

[22] *See NPRM* at ¶ 48.

requests for non-conforming BSS systems (*i.e.*, those proposing to operate at e.i.r.p. levels that are higher than those established in Part 25 of the Commission's rules).[23] Consideration of these issues are premature until the proper technical studies are thoroughly and soberly completed.

B. Consistent with Commission Precedent, Efficient Solutions Are Preferred, and If It Proves Necessary To Update Technical Rules and Coordination Procedures in this Context, They Must Be Carefully Conceived and Properly Calibrated to Ensure that Incumbent Terrestrial FS Providers with Considerable Facilities Investments are Minimally Affected

As mentioned above, the underlying technical research and analysis necessary to develop rules for inter-service operations and sharing in or near 24 GHz band license areas will be time consuming and expensive. The best way to avoid these costs and the costs of ongoing coordination, as well as to promote the Commission's goal of prompt commencement of BSS, is to require that BSS feeder-links be reasonably limited to five and located at least 100 miles outside of 24 GHz terrestrial FS licensed areas. If, however, the Commission concludes that BSS operations prove imperative near or within 24 GHz FS license areas, then substantial resources will need to be devoted by all FS operators and prospective BSS operators to develop technical showings that accurately reflect their current and planned network deployments in the context of co-primary operations. In addition, it is imperative to avoid any requirement that limits the flexibility and immediacy of FS deployments sour substantially reduces FS licensee ability to respond to sudden requirements, including emergency restoration applications. This significant economic impact directly relates to the Initial Regulatory Flexibility Analysis (IRFA) noted in paragraph 103 of the NPRM and must be carefully considered by the Commission

Should the Commission seek to establish sharing criteria near or within license areas, FiberTower will engage with the Commission and BSS operators to ensure that defendable

---

[23] *See NPRM* at ¶ 51.

technical studies and sharing criteria are completed with the appropriate care and are adequate to allow both services to operate. However, if this is necessary, FiberTower respectfully asks that the Commission adhere to its policy of limiting the disruption to facilities-based licensees when an effectively once-exclusive band becomes, in practice, a co-primary band shared between two services, as it has in this instant case.

Respectfully submitted,

FIBERTOWER CORPORATION

By: __/s/_Philip L. Verveer_____
Philip L. Verveer
McLean Sieverding

Willkie Farr & Gallagher LLP
1875 K St., N.W.
Washington, DC 20006
(202) 303-1000

Its Attorneys

October 16, 2006

APPENDIX A – DECLARATION

BEFORE THE
Federal Communications Commission
WASHINGTON, D.C.

In the Matter of	)	
	)	
The Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3-17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-directionally in the 17.3-17.8 GHz Frequency Band	)	IB Docket No. 06-123

DECLARATION

I, William Rummler, Consultant to FiberTower Corporation, hereby declare, under penalty of perjury under the laws of the United States, that I have reviewed the comments submitted by FiberTower Corporation in response to the June 23, 2006 Notice of Proposed Rulemaking in the above-captioned proceeding, and that the statements of fact made therein are true, complete, and correct to the best of my knowledge and belief, and are made in good faith.

William Rummler
Consultant to
FiberTower Corporation

Date: 10/16/06

BEFORE THE
Federal Communications Commission
WASHINGTON, D.C.

In the Matter of	)	
	)	
The Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3-17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-directionally in the 17.3-17.8 GHz Frequency Band	)	IB Docket No. 06-123

REPLY COMMENTS OF FIBERTOWER CORPORATION

FiberTower Corporation ("FiberTower"), by its attorneys and pursuant to Sections 1.415 and 1.419 of the Commission's Rules, 47 C.F.R §§ 1.415, 1.419, hereby files reply comments on the Notice of Proposed Rulemaking in the above captioned proceeding,[1] which specifically seeks to promote "prompt commencement" of the 17/24 GHz Broadcasting Satellite Service ("BSS"). FiberTower supports this goal and is prepared to work with the Commission and BSS operators to develop technical requirements for successful inter-service operations and sharing in the 24

---

[1] *See The Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3-17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-directionally in the 17.3-17.8 GHz Frequency Band*, Notice of Proposed Rulemaking, IB Docket No. 06-123, FCC 06-90 (*rel.* June 23, 2006) ("*NPRM*").

GHz band.[2] At present, however, serious deficiencies exist with respect to the technical coordination models, supporting data, and assumptions that are before the Commission.

I. The FCC Should Accept the Core Recommendation in the Attached Engineering Study From Dr. William Rummler Proposing Adoption of a 100 Mile Separation Between Transmitting BSS Feeder-Link Stations and the Boundaries of 24 GHz Fixed Service Wide-Area Licenses

Gathering the appropriate data and conducting the technical studies necessary to resolve the interference impediments to co-existence in this band will be time consuming and costly for all parties involved. Until such studies can be completed, and non-interference can be assured, FiberTower proposed in its comments,[3] and again urges here, a separation of at least 100 miles between a transmitting BSS feeder-link station and the boundary of a 24 GHz terrestrial fixed service ("FS") licensed area. This pragmatic approach both facilitates the specific goal of prompt commencement of BSS, and protects the considerable investment that FS operators have made to bring wireless backhaul,[4] access,[5] and other important services to the marketplace.

The attached engineering study prepared by Dr. William Rummler concludes that a separation of at least 100 miles between BSS feeder links and 24 GHz FS licensed areas should

---

2 *See NPRM* at ¶¶ 91-93.

3 *See* FiberTower Comments at 7-10.

4 "Wireless backhaul" connects cell sites to a fiber backbone or back to the switch site through the use of wireless transport and hub sites. Radios are placed at the cell site and at the hub site, allowing the backhaul provider to wirelessly transmit backhaul traffic between these two points.

5 "Wireless access" provides high speed voice and data transport between two or more customer locations, or between a hub and a customer location. It can be utilized in many different network topologies, from basic point-to-point networking, to more advanced tree, chain, ring or mesh configurations.

be sufficient to allow rapid, near-term deployment of BSS systems.[6] Because the characteristics of the proposed BSS feeder links and the BSS system are not well defined, this distance may not be the exact minimum necessary to avoid harmful interference. However, as the analysis shows, a 100-mile buffer can reasonably be expected to limit interference concerns such that BSS operations in the band can move forward without delay. Assuming a more refined approach is desired: (i) significantly more information will be required of BSS operators, and (ii) a comprehensive examination and adaptation of the considerable body of industry-developed work regarding terrestrial microwave interference will need to be undertaken.[7]

II. The Geographic Separation Approach to Co-Primary Deployment in the 24 GHz Band is Supported by the Commission's Rules, the International Radio Regulations, and Providers of Both Services

Several key factors support the use geographic separation under the circumstances. First, eighty to ninety percent of the U.S. geography is unlicensed for terrestrial FS operations.[8] This leaves large portions of the country where BSS feeder links could be placed with little to no concern that such stations would cause harmful interference to terrestrial FS operations. Second, commenters planning to operate BSS systems have made clear that these links will be relatively few in number. DIRECTV, for example, asserts that "[b]ecause only a limited number of BSS feeder link earth stations will be deployed in the band, it should be possible to locate them in

---

6 *See A Preliminary Review of Potential BSS Satellite Uplinks At 24 GHz and Technical Recommendations For Co-existence With Existing Wide-Area Licensed Fixed Service Operations*, Dr. William Rummler, November 14, 2006 (Attachment 1).

7 *See* National Spectrum Managers Association (NSMA) Recommendations, developed after considerable study by many FS and satellite industry participants (available at www.nsma.org).

8 *See* FiberTower Comments at 9; *see also* DIRECTV Comments at 29.

areas outside of these licensed areas" and thus endorses geographic separation as a possible solution. [9] Third, geographic separation would preserve an important benefit of the area-wide license concept, which permits providers to continuously optimize their networks in response to changes in technology and demand. Specifically, geographic separation would substantially limit costly and time consuming coordination procedures that would be required when a provider's service footprint changes, which predictably it often will.

In addition, geographic separation is fully consistent with the Commission's rules regarding the choice of sites for earth stations operating in frequency bands shared with equal rights between terrestrial and space services. Specifically, § 25.203(a) requires that such sites "shall be selected, to the extent practicable, in areas where the surrounding terrain and existing frequency usage are such as to minimize the possibility of harmful interference between the shared services."[10]

As noted in FiberTower's initial comments, support for geographic separation can also be drawn from Section 1.4.5 of Appendix 7 of the international Radio Regulations or from Section 1.4.9 of Annex 1 to Recommendation ITU-R SM.1448, which offer guidance regarding procedures for frequency coordination with an area-licensed service. These sections contain similar language specifying that, for fixed earth stations that operate at unspecified locations within a service area defined by the administration, the coordination area is determined by extending the periphery of this service area by the maximum coordination distance. Since the

---

[9] DIRECTV Comments at 29; *see also* SES Americom Comments at 23 ("In addition, as the Commission recognizes, use of this band for BSS operations will involve a limited number of relatively large antennas … .").

[10] 47 C.F.R. § 25.203(a).

reverse situation applies in the 24 GHz band, it is reasonable and prudent to require that sharing in this context also be implemented on the basis of geographic segmentation.[11]

III. Considerably More Information is Required in Order to Adequately Assess the Feasibility of BSS Uplink Deployments Within 100 Miles of 24 GHz Fixed Service Licensed Areas

In light of the Commission's goal of prompt commencement of BSS, and considering that significant technical issues have not yet been adequately explored since the Commission initially allocated frequencies for BSS use, geographic separation, as described herein, is a feasible and efficient solution to permit sharing in the 24 GHz band. However, should the Commission seek to allow BSS feeder links in, or within 100 miles of, FS licensed areas, numerous technical unknowns would need to be fully explored by the providers of both services. In order to accomplish this, significantly more information is needed, including, but not limited to:

- Introduction into the record in this proceeding of all filings at the Commission by the BSS community (license applications, technical proposals, technical *ex parte* materials, deployment architectures, etc.).
- Specification sheets (*i.e.*, "spec sheets") detailing the precise BSS uplink equipment proposed for use.

Also, numerous questions need answering, including, but not limited to:

- Is it accurate that all the proposed and envisioned systems are geosynchronous orbit (GSO) systems? Are non-geosynchronous orbit (NGSO) systems to be accommodated?
- Are BSS uplinks proposed for operation at angles that cross over FS license areas? If so, what angle(s), power(s) and frequencies? Is automated power control placed into these designs?

---

[11] Although the procedures of Recommendation ITU-R SF.1707 could be applied, they are only relevant when the other service (the BSS feeder links at 25 GHz) is not intensively used. Due to the potentially large coordination areas that are possible with some of the proposals in this NPRM, the use of the 25 GHz band by the BSS would not qualify unless significant operational restrictions were applied to the transmitting earth stations.

- Are BSS mitigation techniques like shielding and earth berms in the proposed uplink designs?
- Where are uplinks proposed for operation? How many? What is the proposed deployment schedule?

Finally, the attached engineering study by Dr. Rummler notes that a *preliminary* study of *some* fixed service systems indicates that substantial changes are needed in the PFD limit (from -114 dBW/m^2/MHz to at least -142 dBW/m^2/MHz) to protect fixed service operations. The study is preliminary in nature due, in part, to the fact that: (i) it takes into account some, yet not all, *existing* 24 GHz fixed service systems, and (ii) it does not review the interference protection criteria needed for new 24 GHz systems slated for introduction into the marketplace in 2007 and 2008.

IV. Conclusion

Locating BSS feeder-links at least 100 miles outside of 24 GHz terrestrial FS licensed areas is a sensible, straight-forward, and immediate solution that limits the burden upon BSS licensees and allows for prompt commencement of BSS until comprehensive sharing criteria are developed to ensure a predicable and stable interference envirnment. An alternative or complementary approach includes locating BSS uplinks closer to FS license area boundaries if the PFD limit in Section 101.509 is modified from -114 dBW/m^2/MHz to -142 dBW/m^2/MHz.

Respectfully submitted,

_____/s/_____
Counsel for FiberTower Corporation

Joseph M. Sandri Jr.
Senior Vice President
FiberTower Corporation
7925 Jones Branch Rd.
Suite 3300
McLean, VA 22102
(703) 873-4175

Philip L. Verveer
McLean Sieverding
Willkie Farr & Gallagher LLP
1875 K St., N.W.
Washington, DC 20006
(202) 303-1000

November 15, 2006

Attachment 1 to FiberTower's Reply Comments

A Review of Potential BSS Satellite Uplinks At 24 GHz and Technical Recommendations For Co-existence With Existing Wide-Area Licensed Fixed Service Operations

By Dr. William Rummler, November 14, 2006

This study provides an alternative approach to Fiber Tower's previous view of the need for a 100 mile separation between satellite earth stations transmitting in the 24 GHz fixed service band and the boundaries of fixed service 24 GHz band licensed areas. The study provides a calculation for a pfd limit required to protect fixed service receivers. This study is based on projections of current art receiver front end design for fixed service receiving equipment and involves computation of the interference power at the victim receiver input which will raise its threshold by 1 dB.[12] The resulting separation distances are more responsive to the emissions toward the FS service area and are comparable to the 100 mile distances in some typical cases.

The permissible power flux density at the boundary of the fixed service license area as determined below is –142 dBW/m^2/MHz. It should be noted that calculations leading to this pfd are not based on the largest antenna size that could be used at 24 GHz and do not include exposure from more than one earth station interfering source, both of which, if included, would cause the allowable pfd to decrease to a more stringent level. The multiple exposure issue deserves further study as more information becomes available regarding BSS system deployment. In addition, FiberTower believes all calculations must be made using maximum earth station transmitter power, since a lack of path loss correlation may be expected on the earth station primary and interference paths.

Either the 100-mile minimum distance separation criterion suggested in FiberTower's comment filing in this proceeding, or the use of a -142 dBW/m^2/MHz power flux-density limit at the FS service area boundary, would allow rapid near-term deployment of BSS systems. In the longer term, for development of a computational process that would facilitate closer siting of earth stations to licensed FS boundaries, FiberTower believes examination and adaptation of the considerable body of industry-developed work on calculation of terrestrial microwave interference would be productive.[13] Additionally, this instant study shows that 47 CFR Section 101.509 requires substantial revision. Section 101.509 includes the Commission's recommendation that coordination between terrestrial systems in this band licensed to operate in adjacent service areas is not necessary if the PFD at the boundary of the relevant adjacent area is lower than -114 dBW/m^2 in any one MHz. The instant study reveals that the PFD at the boundary should be no greater than -142 dBW/m^2 in any one MHz.

---

[12] One dB degradation of the receiver noise threshold is a criterion long recognized by industry and supported by TIA TSB 10, which is referenced in 47CFR Section 101.105.

[13] See the National Spectrum Managers Association (NSMA) Recommendations, developed after considerable study by many FS and satellite industry participants; available at www.nsma.org.

Consideration of PFD Limits and Received Interference Power

1. The Section 101.509(c) limit of -114 dBW/m^2/MHz is too high

Other commenters have cited Section 101.509(c) as an appropriate reference. The origin of the numbers and the means of implementing them as a criterion are not at all clear. The following paragraphs consider the problems of implementing this criterion and provide a path forward. A receive antenna gain of 45 dBi as characteristic of the FS systems to be protected is used. With such an antenna near the boundary of the licensed area that is being protected by a pfd limit of -114 dBW/m^2/MHz, the resulting interference power at the receiver input would be -118 dBW/MHz. (pfd = -114 dBW/m^2 in any 1 MHz band and G_R = 45 dBi, P_R = -118 dBW/MHz; see Annex A) This is to be compared to the noise floor of -140 dBW/MHz for a receiver with a 4 dB noise figure. An acceptable level of interference into such a receiver is 6 dB below this or -146 dBW/MHz. Thus the level of interference power reaching the receiver would exceed an acceptable level by 28 dB if there were no other considerations.

2. Discussion of how pfd limits have previously been used

In the case of pfd limits on space-to-earth emissions from satellites, conformance with pfd limits is based on the determination of the pfd under free-space propagation conditions in the absence of atmospheric attenuation. One might expect the pfd due to emissions from an earth station to be determined on the same basis, but conformance with the pfd limit on this basis would produce an acceptable level of interference only if the earth station was separated from the boundary of the FS service area by a large enough distance. For a station on the surface of the earth the specific attenuation due to atmospheric losses under standard conditions is about 0.19 dB/km. Hence if the earth station is more than 147 km from the boundary of the FS service area, the atmospheric attenuation would reduce the interference to an acceptable level. (A slightly smaller value of specific attenuation, the value for the month in which it is expected to have its lowest value, would be more appropriate.)

3. Scenarios producing a level of -114 dBW/m^2/MHz

The approach described in the preceding paragraph may fail to protect the FS in many cases where the e.i.r.p. toward the horizon from a feeder link earth station in the 24 GHz band is low. For example, the EchoStar comments, page 20 of the Technical Annex, mention an e.i.r.p. toward the horizon of 3.4 dBW/MHz. In this case the spreading loss would provide a -114 dBW/m^2/MHz pfd in the absence of atmospheric attenuation at a distance of 7.7 km. Since the atmospheric loss would provide only about 1.5 dB of attenuation, operation of such an earth station would exceed an acceptable level by 26.5 dB (28 – 1.5). One proposal to avoid this problem would be to impose the 28 dB tightening to the criterion and allow the specific attenuation for atmospheric loss to be included in determining whether the pfd requirement is met.

4. Preliminary Recommendation

Thus, the pfd criterion specified in 101.509(c) should be changed to -142 dBW/m^2 in any 1 MHz band and the earth station conformance with this pfd would be determined as follows. The pfd at the boundary of the FS service area would be determined by applying the spreading loss for the distance of the earth station from the boundary to the e.i.r.p. of the earth station toward the horizon on the azimuth toward the boundary. When transmit power control is used, the e.i.r.p. to be used in this calculation is the maximum value.

This approach has the advantage that it can be easily applied and could be implemented in Section 101.509 of the FCC Rules. Thus, it could facilitate the rapid introduction of the BSS services into the 17/24 GHz bands while providing adequate protection to the existing and future FS systems in the 24 GHz band. While it may be possible to develop procedures that would allow feeder link earth stations to be located closer to FS service areas than either of the methods proposed by Fiber Tower, these would best be developed in an industry group with participation of all interested parties. This work could be undertaken by NSMA or by a joint group formed for the purpose in TIA. In either case this would be a lengthy process that, without the application of the proposed minimum distance criterion or maximum pfd limits, could delay the introduction of BSS services in the 17/24 GHz bands.

Annex A: PFD and Received Power Equations

The following equations were used in developing the technical annex.

The formula for determining received power specral density is given as

$$P_R = P_T + G_T - L_{bf} + G_R \quad (1)$$

where

P_R is the received power specral-density (dBW/MHz);

P_T is the transmitted power specral-density (dBW/MHz);

G_T is the maximum gain of the transmit antenna (dBi);

G_R is the maximum gain of the receive antenna (dBi);

L_{bf} is the free-space basic transmission loss (dB).

With

$$\text{e.i.r.p.} = P_T + G_T$$

$L_{bf} = 20\log(4\pi d / \lambda)$ with d and λ in same units, meters in this analysis,

Equation 1 may be rewritten as

$$P_R = \text{e.i.r.p.} - 10\log(4\pi d^2) - 10\log(4\pi f^2 / c^2) + G_R \quad (2)$$

Since the spreading loss is defined as $10\log(4\pi d^2)$, Equation 2 may be rewritten as

$$P_R = \text{pfd} - 10\log(400\pi f_{Ghz}^2 / 9) + G_R$$

Or with f = 24 GHz:

$$P_R = pfd - 49.05 + G_R$$

BEFORE THE

Federal Communications Commission

WASHINGTON, D.C.

In the Matter of	)	
	)	
The Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3-17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-directionally in the 17.3-17.8 GHz Frequency Band	)	IB Docket No. 06-123

DECLARATION

I, Dr. William Rummler, consultant to FiberTower Corporation, hereby declare, under penalty of perjury under the laws of the United States, that I prepared the technical attachment submitted by FiberTower Corporation in its Reply Comments in response to the June 23, 2006 Notice of Proposed Rulemaking in the above-captioned proceeding, and that the statements of fact made therein are true, complete, and correct to the best of my knowledge and belief, and are made in good faith.

Dr. William Rummler
Consultant to FiberTower Corporation

Date: 11/15/06